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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/749,191	12/26/2000	Kashmir S. Sahota	E0520CIP	6191

7590

12/19/2002

Advanced Micro Devices, Inc.
Technology Law Dept. M/S 68
One AMD Place
P.O. Box 3453
Sunnyvale,, CA 94088-3453

EXAMINER

UMEZ ERONINI, LYNETTE T

ART UNIT

PAPER NUMBER

1765

DATE MAILED: 12/19/2002

14

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/749,191

Applicant(s)

SAHOTA ET AL

Examiner

Lynette T. Umez-Eronini

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 December 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 58-61 and 63-73 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 58-61 and 63-73 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

This communication is responsive to a Request for Continued Prosecution, which was filed on December 11, 2002 for application No. 09/749,191 and reconsideration of the amendment(s) previously filed on November 8, 2002, in an Advisory action. An action on the RCE follows and incorporates a response applicant's arguments in the said Advisory.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claim 58 and 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uzoh et al. (US 5,807,165) in view of Murphy et al. (US 5,478,435).

Uzoh teaches a method of planarizing a semiconductor wafer that has a SiO₂ insulator layer **16**, a Cu layer **SL** and a Ta metal line layer **LL** (column 1, lines 33-42; column 5, lines 33-37; and Figure **6**). The method includes using a CMP apparatus **60**, which includes a rotatable polishing platen **62** attached to a rotatable shaft **68**, a polishing pad **64** mounted to the platen **62**, a means for urging carrier **66** against the pad **64**, and a polishing slurry supply system in fluid communication with the pad **64**. The supply system includes a container **70** coupled to a conduit **72** arranged and dimensioned for dispensing polishing slurry **74** onto the pad **64** (column 5, lines 41-54).

Art Unit: 1765

and Figures 7-10). The polishing slurry containing silica abrasive, water (DI water), 7% concentration of benzotriazole (same as applicant's copper passivation agent) and a nonionic surfactant such as Alkanol (which is the trade mark for a series of fatty alcohol-ethylene oxide condensation products and is the same applicant's polyethylene oxide surfactant), (column 4, lines 56-62). The aforementioned reads on a chemical-mechanical polishing (cmp) method comprising incorporating into said polishing slurry, an organic additive (Alkanol).

Uzoh differs in failing to teach incorporating into said polishing slurry for a final portion of said total polishing period of time less than or equal to 10% of said total polishing period of time and said organic additive not being included in said polishing slurry prior to said final portion of said total polishing period of time.

Murphy teaches a slurry dispensing system with controls for additive infusion, independently pumping an unmixed slurry and a diluting agent, mixing the slurry and diluting agent at the point of use on the pad or in a dispensing line just prior to the point of use, and using a third independent distribution lines to dispense a chemical additive at or near the point of use (Abstract). Murphy further teaches, "Time at temperature and mixing of the liquids can be delayed until the liquid is within centimeters of actual dispense onto the polishing pad" (column 6, lines 12-16). Hence, the aforementioned reads on,

additive not being included in said polishing slurry prior to said final portion of said total polishing period of time.

Art Unit: 1765

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Uzoh by using Murphy method of dispensing a chemical additive for the purpose reducing the cost in the use of slurries (Murphy, column 6, lines 4-7 and 23-26).

The said ("Time at temperature and mixing of the liquids can be delayed . . .") aforementioned has shown that Murphy serves as evidence that the polishing period of time is a so-called "result effective variable." It has been held that the discovery of an optimum value for result effective variables is within the purviews of routine experimentation by the person of ordinary skill in the art. In re Boesch, 617, F.2d 272, 276, 205 USPQ 215, 219 (CCPA 1980).

Uzoh differs in failing to teach said polishing slurry containing said organic additive is formed by Point-of-Use (POU) mixing of said organic additive with said polishing slurry containing said DI water, said silica abrasive, and said Cu passivation agent, **in claim 59**.

Murphy teaches a method comprises a point of use slurry dispensing system with controls for dilution, temperature, and chemical infusion (column 3, lines 4-6). In one embodiment, liquid slurry **14** is introduced into container **21** and dispensed onto a platen **12** (or pad **13**) by a pump **22** that is utilized for controlling the flow rate of the slurry (column 4, lines 10-15). Another container **26** and pump **27** function respectively and equivalently as units **21** and **22** to provide a duplicate dispensing system for dispensing another liquid onto platen **12** (column 4, lines 48-52). The dispensing

Art Unit: 1765

system **20** of FIG. **1** is flexible in that each of the liquid dispensing line is independent of the other. Thus, liquid flow rates and temperature of the each liquid can be set at different levels and controlled separately. Additionally, if desired, other agents (such as oxidizers, etchants and/or chemical additives) can be introduced and combined with the liquids in container **21** and/or container **26** (column 5, lines 5-12). Murphy also teaches, "Time at temperature and mixing of the liquids can be delayed until the liquid is within centimeters of actual dispense onto the polishing pad" (column 6, lines 12-16). Since Murphy teaches the adding of liquids to the polishing pad can be delayed and uses the same point of use mixing as that of the claimed invention then using Murphy method of planarizing a wafer by point of use mixing would result in said polishing slurry containing said organic additive is formed by Point-of-Use (POU) mixing of said organic additive with said polishing slurry containing said DI water, said silica abrasive, and said Cu passivation agent, adding the additive at a first or a second or any stage during the polishing.

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Uzoh by using Murphy's method of point of use mixing in combining an organic additive with the components of a polishing slurry for the purpose of providing substantial cost and time reduction in the use of slurries, as well as allowing for improved controls over the use of the slurry (Murphy, column 6, lines 21-24).

Art Unit: 1765

3. Claims 60-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uzoh ('165) in view of Murphy ('435) as applied to claim 58 above, and further in view of Yu et al. (US 5,240,552)

Uzoh teaches benzotriazole having a concentration of 200 ppm to 7%, and Alkanol (same as applicant PEG 10,000) in combination with water and silica (column 4, lines 56-61), which suggests that the concentrations of the components of the slurry are variable.

Uzoh differs in failing to teach the slurry containing 1.54 wt% 1,2,4-triazole; 0.5 wt% PEG-10,000; 93.6 wt% silica suspension containing 13.6 wt% SiO₂; and 4.33 wt% DI water, **in claim 61**.

Yu teaches process parameters of CMP process includes time, wafer backside pressure down force, and polishing slurry composition (column 4, lines 29-32) and polishing slurry flow (column 2, lines 53-56) can be adjusted to improve the uniformity of the process (column 2, lines 62-63 and Abstract).

Hence, it is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Uzoh in view of Murphy by employing any of a variety of operational variables such as the concentration and flow rate of the polishing slurry and the pressure and time as taught by Yu for the purpose of improving the uniformity of the CMP process (Yu, column 2, lines 62-63 and Abstract). Yu serves as evidence that concentration and flow rate of the polishing slurry and the pressure and time is a so-called "result effective variable." It has been held that the discovery of an optimum value for result effective variables is within the purviews of

Art Unit: 1765

routine experimentation by the person of ordinary skill in the art. In re Boesch, 617, F.2d 272, 276, 205 USPQ 215, 219 (CCPA 1980).

4. Claims 63, 65, 66, 67, 68 and 70, and 73 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uzoh ('165) in view of Murphy et al. ('435).

Uzoh differs in failing to teach decreasing the flow of said polishing slurry prior to the step of removing wafer from against the platen and flowing a polishing additive solution onto the platen for a second period of time while inducing relative motion between said wafer and said platen and maintaining a force between said platen and said wafer; and following said step of decreasing said flow of said polishing slurry and prior to said step of removing said wafer from against said platen, flowing a polishing additive solution onto said platen, **in claim 63**.

Murphy teaches a method of dispensing a liquid slurry in polishing a surface. The method comprises a point of use slurry dispensing system with controls for dilution, temperature, and chemical infusion (column 3, lines 4-6). In one embodiment, liquid slurry **14** is introduced into container **21** and dispensed onto a platen **12** (or pad **13**) by pump **22** that is utilized for controlling the flow rate of the slurry (column 4, lines 10-15). Another container **26** and pump **27** function respectively and equivalently as units **21** and **22** to provide a duplicate dispensing system for dispensing another liquid onto platen **12** (column 4, lines 48-52). The dispensing system **20** of FIG. **1** is flexible in that each of the liquid dispensing line is independent of the other. Thus, liquid flow rates and temperature of the each liquid can be set at different levels and controlled

Art Unit: 1765

separately. Additionally, if desired, other agents (such as oxidizers, etchants and/or chemical additives) can be introduced and combined with the liquids in container **21** and/or container **26** (column 5, lines 5-12). Since Murphy uses the same method of dispensing a polishing slurry and additive in planarizing a wafer as that of the claimed invention then using Murphy's method of planarizing a wafer by point of use mixing a polishing additive with a polishing slurry reads on, decreasing the flow rate of the polishing slurry prior to removing the wafer from the platen; and following said step of decreasing the flow rate of the polishing slurry and the flow rate of the polishing slurry, flowing a polishing additive solution onto said platen and would inherently result in flowing a polishing additive solution onto said platen for a second period of time while inducing relative motion between said wafer and said platen and maintaining a force between said platen and said wafer.

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Uzoh by using Murphy's point of use mixing in decreasing the flow of the polishing slurry prior to removing the wafer from against the platen; and following said step of decreasing the flow rate of the polishing slurry, flowing a polishing additive solution onto said platen for the purpose of providing substantial cost and time reduction in the use of slurries, as well as allowing for improved controls over the use of the slurry (Murphy, column 6, lines 21-24).

Uzoh also differs in failing to teach and said polishing slurry not including said organic additive prior to said step of flowing said polishing additive solution **in claim 63**.

Art Unit: 1765

Murphy teaches a slurry dispensing system with controls for additive infusion, independently pumping a slurry in unmixed form and a diluting agent, mixing the slurry and diluting agent at the point of use on the pad or in a dispensing line just prior to the point of use, and using a third independent distribution lines to dispense a chemical additive at or near the point of use (Abstract). Murphy further teaches, "Time at temperature and mixing of the liquids can be delayed until the liquid is within centimeters of actual dispense onto the polishing pad" (column 6, lines 12-16). Hence, the aforementioned reads on,

additive not being included in said polishing slurry prior to said final portion of said total polishing period of time.

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Uzoh by using Murphy method of dispensing a chemical additive for the purpose reducing the cost in the use of slurries (Murphy, column 6, lines 4-7 and 23-26).

5. Claims 64, 69, 71 and 73 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uzoh ('165) in view of Murphy ('435) as applied to claim 63 above, and further in view of Yu et al. ('552).

Uzoh in view of Murphy differs in failing to teach the concentrations of the polishing additive comprises 2.0-3.0 wt% 1,2,4-triazole; 0.1-2.0 wt% PEG-10,000; and DI water, **in claims 69 and 73**; and 0.5 - 2.0 psi down force of 5-30 second in a post-

Art Unit: 1765

CMP buff step, **in claim 73**, and decreasing the flow rate of polishing slurry to zero, **in claims 64 and 71**.

Yu teaches process parameters of CMP process includes time, wafer backside pressure down force, and polishing slurry composition (column 4, lines 29-32) and polishing slurry flow (column 2, lines 53-56) can be adjusted to improve the uniformity of the process (column 2, lines 62-63 and Abstract).

Hence, it is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Uzoh in view of Murphy by employing any of a variety of operational variables such as the concentration and flow rate of the polishing slurry, the pressure and time as taught by Yu for the purpose of improving the uniformity of the CMP process (Yu, column 2, lines 62-63 and Abstract). Yu serves as evidence that concentration and flow rate of the polishing slurry and the pressure and time is a so-called "result effective variable." It has been held that the discovery of an optimum value for result effective variables is within the purviews of routine experimentation by the person of ordinary skill in the art. In re Boesch, 617, F.2d 272, 276, 205 USPQ 215, 219 (CCPA 1980).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 703-306-9074. The examiner is normally unavailable on the First Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on 703-308-3836. The fax phone numbers

Art Unit: 1765

for the organization where this application or proceeding is assigned are 703-972-9310
for regular communications and 703-972-9311 for After Final communications.

Lynette T. Umeg-Eronini

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December 14, 2002